http://water.epa.gov/polwaste/npdes/swbmp/BMP-Inspection-and-Maintenance.cfm

BMP Inspection and Maintenance

Minimum Measure: Post-Construction Stormwater Management in New Development and Redevelopment

Subcategory: Municipal Program Elements

Description

Regular inspection and maintenance of storm water best management practices is important to ensure that the practices are functioning properly and to remove trash and organic debris

The effectiveness of post-construction stormwater control best management practices (BMPs) depends upon regular inspections of the control measures. Generally, BMP inspection and maintenance falls into two categories: expected routine maintenance and non-routine (repair) maintenance. Routine maintenance is performed regularly to maintain both the ascetics of the BMPs and their good working order. Routine inspection and maintenance helps prevent potential nuisances (odors, mosquitoes, weeds, etc.), reduces the need for repair maintenance, and reduces the chance of polluting stormwater runoff by finding and fixing problems before the next rain.

In addition to maintaining the effectiveness of stormwater BMPs and reducing the incidence of pests, proper inspection and maintenance is essential to avoid the health and safety threats inherent in BMP neglect (Skupien, 1995). The failure of structural stormwater BMPs can lead to downstream flooding, which can cause property damage, injury, and even death.

Applicability

Under the stormwater Phase II rule, owners and operators of small municipal separate storm sewer system (MS4) facilities are responsible for implementing BMP inspection and maintenance programs and having penalties in place to deter infractions. All stormwater BMPs should be inspected on a regular basis for continued effectiveness and structural integrity. In addition to regularly scheduled inspections, all BMPs should be checked after each storm event. Scheduled inspections will vary among BMPs. Structural BMPs such as storm drain drop inlet protection may require more frequent inspection to ensure proper operation. During each inspection, the inspector should document whether the BMP is performing correctly, if the BMP has been damaged since the last inspection, and, if so, what should be done to repair it.

Siting and Design Considerations

In the case of vegetative or other infiltration BMPs, inspection of stormwater management practices following a storm event should occur after the expected drawdown period for a given BMP. This allows the inspector to see whether detention and infiltration devices are draining correctly.

Inspection checklists should be developed for use by BMP inspectors. Checklists might include each BMP's minimum performance expectations, design criteria, structural specifications, date of implementation, and expected life span. In addition, the maintenance requirements for each BMP should be listed on the inspection checklist. This will help the inspector determine if a BMP's maintenance schedule is adequate or in need of revision. Also, a checklist will help the inspector determine renovation or repair needs.

Limitations

Routine maintenance materials like shovels, lawn mowers, and fertilizer may be easily obtained on short notice with little effort. Unfortunately, not all materials that may be needed for emergency structural repairs are obtained so easily. Thought should be given to stockpiling essential materials in case immediate repairs must be made to safeguard against property loss and to protect human health.

Maintenance Considerations

It is important that routine maintenance and non-routine repair of stormwater BMPs be done according to a schedule or as soon as a problem is discovered. Because many BMPs are rendered ineffective for runoff control if not installed and maintained properly, it is essential that maintenance schedules are maintained and repairs made promptly. In fact, some cases of BMP neglect can have detrimental effects on the landscape and increase the potential for erosion. However, routine maintenance, such as mowing grasses, should be flexible enough to accommodate the fluctuations in need based on relative weather conditions. For example, more harm than good may be caused by mowing during an extremely dry period or immediately following a storm.

Effectiveness

The effectiveness of BMP inspection will be a function of the inspector's familiarity with each BMP's location, design specifications, maintenance procedures, and performance expectations. Documentation should be kept of the dates of inspection, findings, and maintenance and repairs that result from the findings of an inspector. Such records help maintain an efficient inspection and maintenance schedule and provide evidence of ongoing inspection and maintenance.

Because stormwater BMP maintenance work is usually not technically complicated (mowing, removal of sediment, etc.), workers can be drawn from a large labor pool. As structural BMPs increase in their sophistication, however, more specialized maintenance training might be needed to sustain BMP effectiveness.

Cost Considerations

Mowing of vegetated and grassed areas may be the costliest routine maintenance consideration (WEF, 1998). Management practices using relatively weak materials (such as filter fabric and wooden posts) may mean more frequent replacement and, therefore, increased costs. The use of more sturdy materials (such as metal posts) where applicable may increase the life of certain BMPs and reduce replacement costs. However, the disposal requirements of all materials should be investigated before implementation. This is to ensure proper handling after the BMP has become ineffective, or when it has to be discarded after the site has reached final stabilization. Table 1 shows maintenance costs, specific activities, and schedules for several post-construction runoff BMPs.

Table 1. Maintenance costs, activities, and schedules for urban management practices (Adapted from CWP, 1998)

Type of Practice	Management Practice	Annual Maintenance Cost (% of Construction Cost)	Maintenance Cost for a "Typical" Application	Maintenance Activity	Schedule
Detention/ Retention Practices	Ponds/ wetlands	3%-6%	$3,000 to $6,000	• Cleaning and removal of debris after major storm events; (>2" rainfall) • Harvesting vegetation when a 50% reduction in the original open water surface area occurs • Repairing embankment and side slopes • Repairing control structure	Annual or as needed
				• Removing accumulated sediment from forebays or sediment storage areas when 60% of the original	5-year cycle

				volume has been lost	
				• Removing accumulated sediment from main cells of pond once 50% of the original volume has been lost	20-year cycle
	Dry Ponds	~1%	$1,200	See above	
	Wetlands	~2%	$3,800	See above	
Infiltration Facilities	Infiltration Trench	5%-20%	$2,300 to $9,000	• Cleaning and removing debris after major storm events; (>2" rainfall) • Mowing and maintening upland vegetated areas • Sediment cleanout • Repairing or replacing stone aggregate • Maintaining inlets and outlets	Annual or as needed
				• Removing accumulated sediment from forebays or sediment	4-year cycle

				storage areas when 50% of the original volume has been lost	
	Infiltration Basin	1%-10%	$150-$1,500	• Cleaning and removing debris after major storm events; (>2" rainfall) • Mowing and maintaining upland vegetated areas • Sediment cleanout	Annual or as needed
				• Removing accumulated sediment from forebays or sediment storage areas when 50% of the original volume has been lost	3- to 5-year cycle
Filtration Practices	Sand Filters	11%-13%	$2,200	• Removing trash and debris from control openings • Repairing leaks from the sedimentation chamber or deterioration of structural components	Annual or as needed

				• Removing the top few inches of sand, and cultivation of the surface, when filter bed is clogged	
				• Cleaning out accumulated sediment from filter bed chamber once depth exceeds approximately 1/2", or when the filter layer will no longer draw down within 24 hours • Cleaning out accumulated sediment from sedimentation chamber once depth exceeds 12 inches	3- to 5-year cycle
	Dry Swales, Grassed Channels, Biofilters	5%-7%	$200 to $2,000	• Mowing and removing litter/debris • Stabilizing eroded side slopes and bottom • Managing nutrient and pesticide use	Annual or as needed

				• Dethatching swale bottom and removing thatching • Discing or aerating swale bottom	
				• Scraping swale bottom and removing sediment to restore original cross section and infiltration rate • Seeding or sodding to restore ground cover (use proper erosion and sediment control)	5-year cycle
	Filter Strips	$320/acre (maintained)	$1,000	• Mowing and removing litter/debris • Managing nutrient and pesticide use • Aerating soil on the filter strip • Repairing eroded or sparse grass areas	Annual or as needed

	Bioretention	5%-7%	$3,000 to $4,000	• Repairing erosion areas • Mulching of void areas • Removingand replacing all dead and diseased vegetation • Watering plant material	Biannual or as needed
				• Removing mulch and applying a new layer	Annual

References

Center for Watershed Protection (CWP). 1998. *Costs and Benefits of Stormwater BMP's: Final Report 9/14/98.* Center for Watershed Protection, Ellicott City, MD.

Montgomery County Department of Environmental Protection. 1999. *Maintaining Urban Stormwater Facilities: A Guidebook for Common Ownership Communities.* [http://www6.montgomerycountymd.gov/ocptmpl.asp?url=/content/ocp/ccoc/ccoc_index.asp EXIT Disclaimer]. Accessed November 10, 2005.

Santa Clara Valley Urban Runoff Pollution Prevention Program. 2005. *Example BMP Inspection and Maintenance Checklist.* [www.scvurppp-w2k.com/bmp_om_forms.htm EXIT Disclaimer]. Accessed November 10, 2005.

Skupien, J. 1995. Post-construction Responsibilities for Effective Performance of Best Management Practices. In *National Conference on Urban Runoff Management: Enhancing Urban Watershed Management at the Local, County, and State Levels. Seminar Publication*. EPA 625-R-95-003. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

USEPA. 2000. *Fact Sheet 2.6: Stormwater Phase II Final Rule, Construction Site Runoff Control Minimum Control Measure*. EPA 833-F-00-008. U.S. Environmental Protection Agency, Office of Water, Washington, DC.

Water Environment Federation. 1998. *Urban Runoff Quality Management*. WEF Manual of Practice No. 23, ASCE Manual and Report on Engineering Practice No. 87. Water Environment Federation and American Society of Civil Engineers, Alexandria, VA.